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(58) Field of search
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INT CL[5] H05B
Online databases: WPI

(54) Oven with microwave convection and radiant heating

(57) Perforated walls 23 divide off corners of the turntable oven. The space behind the perforated walls that would otherwise be wasted, contains a duct 80 within which are disposed a resistance heating coil 88 and a fan 84. Preferably a magnetron 54 is also housed there. Radiant heat may be provided by resistance element (15, Fig. 3).

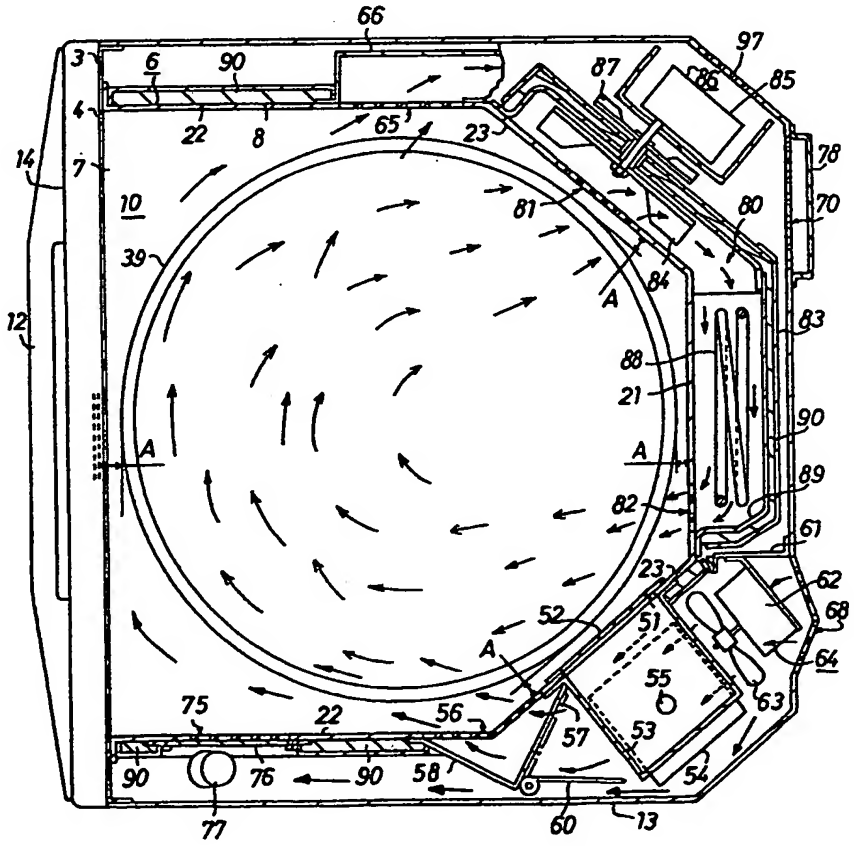

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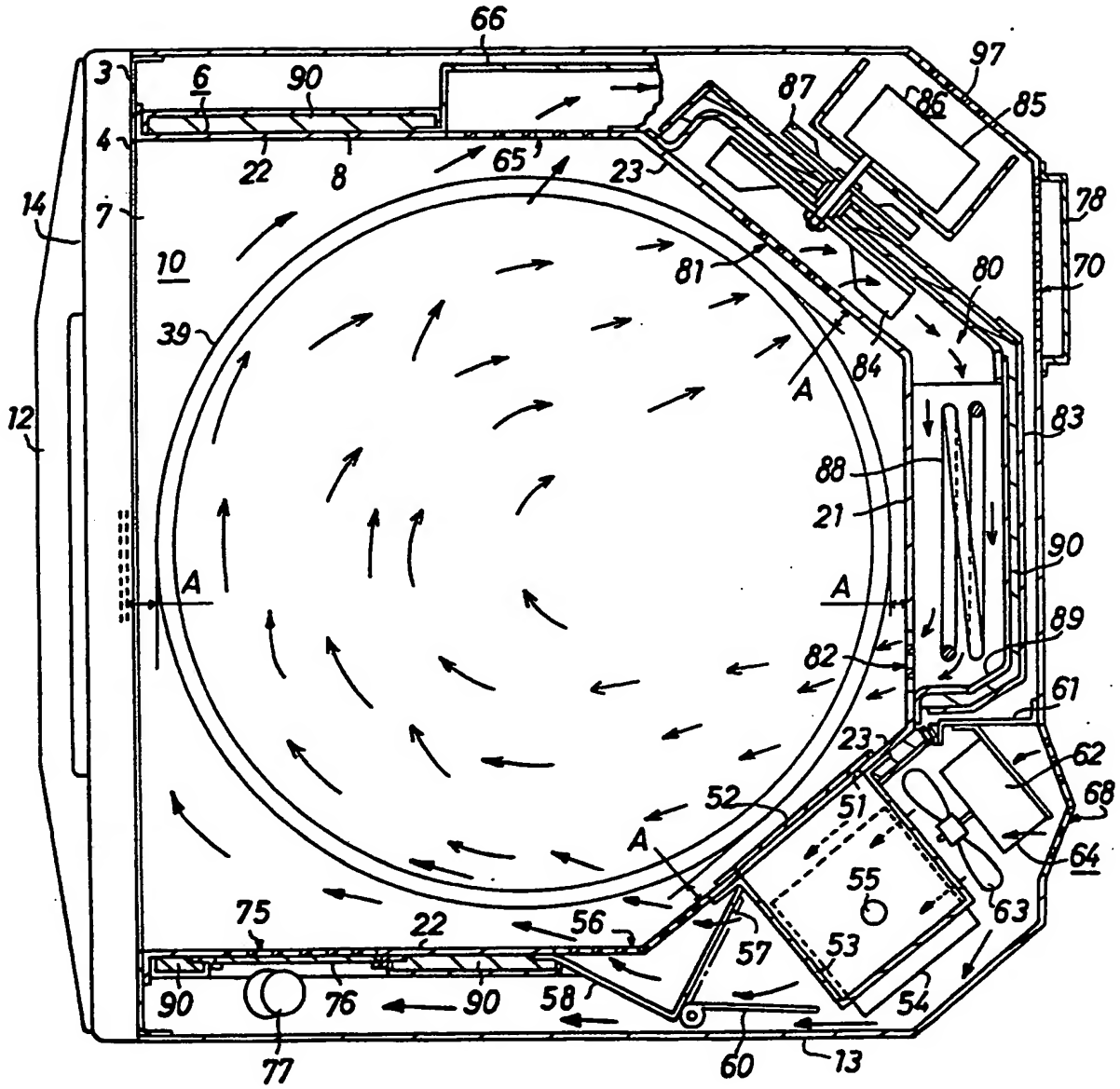
Fig. 1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84
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83
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89
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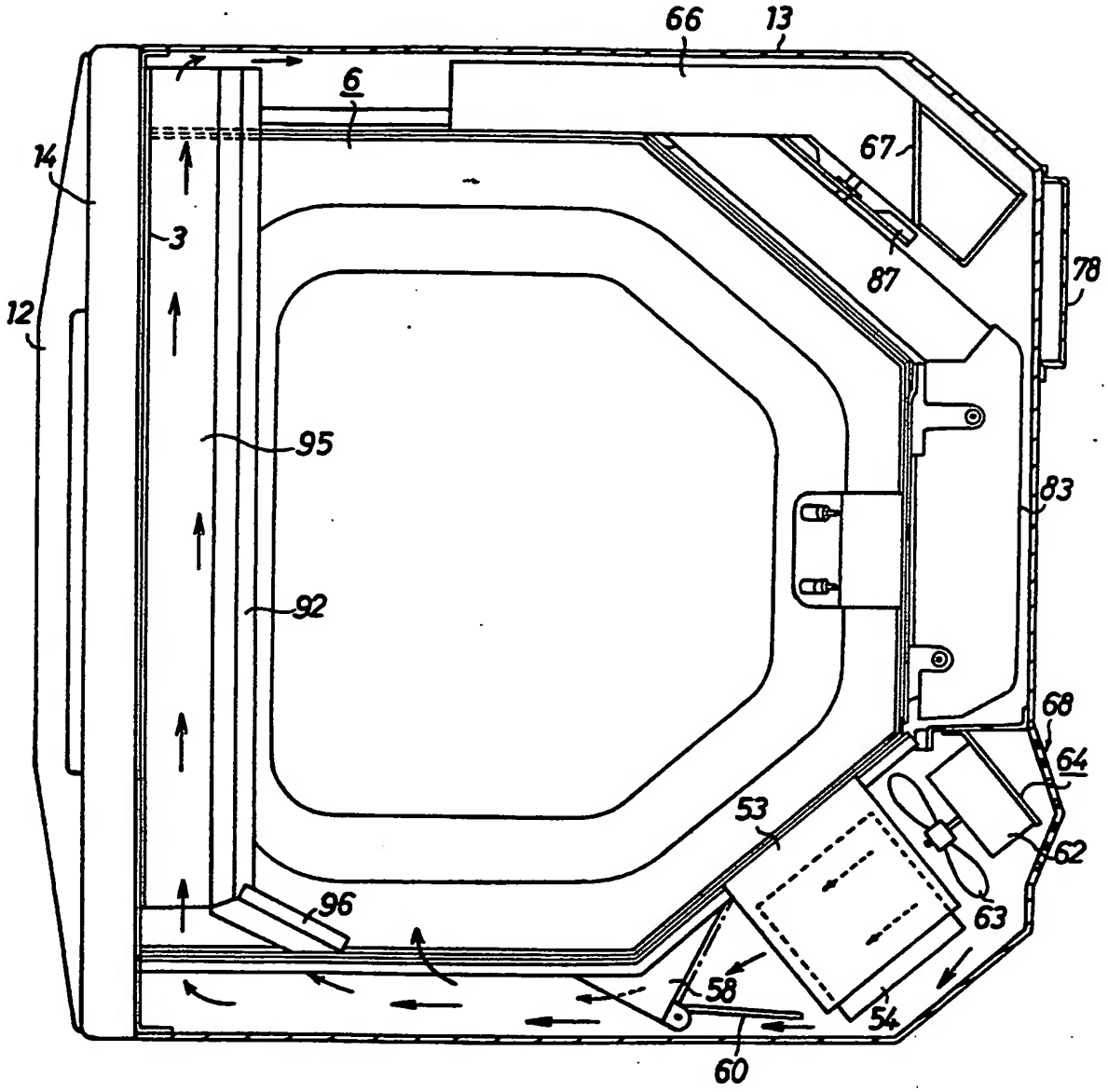
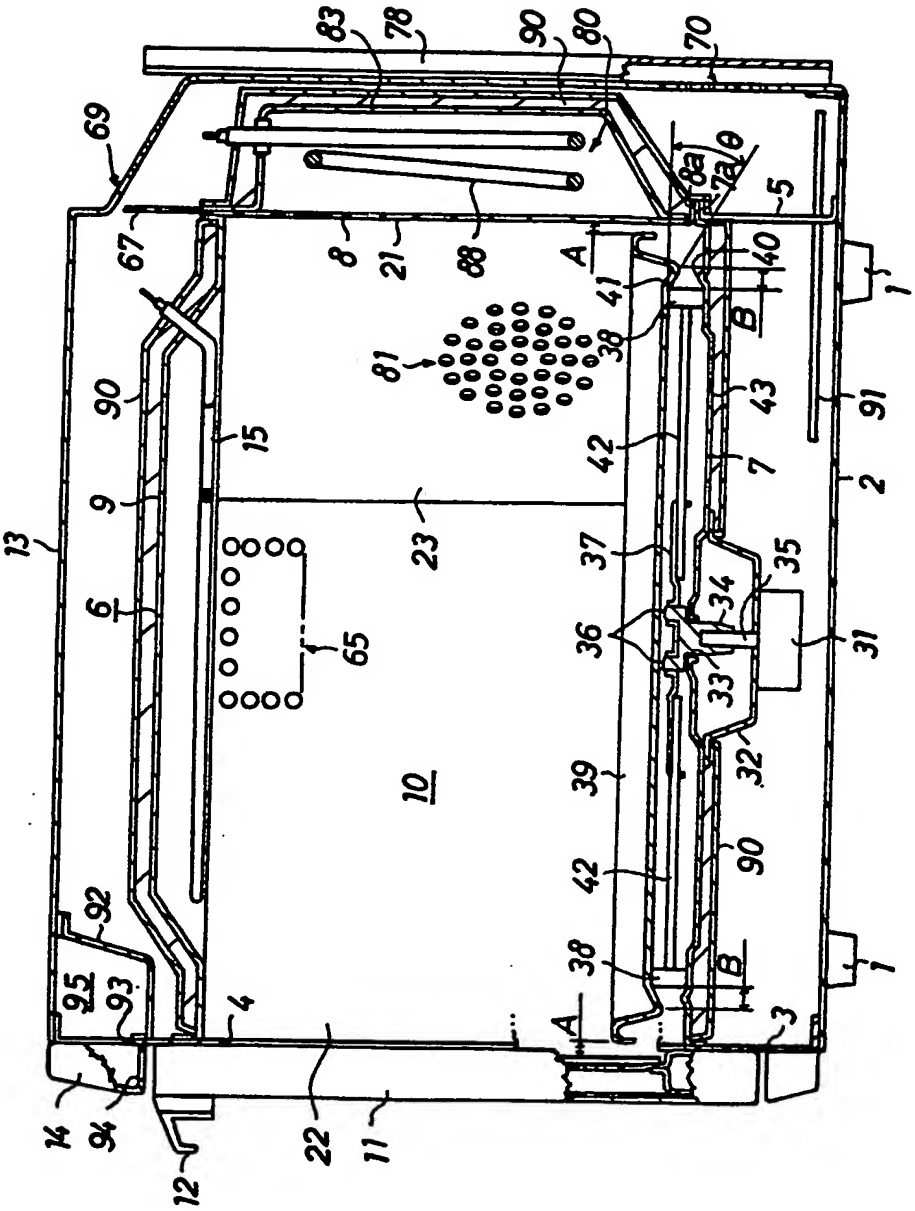
Fig. 2

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69
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88
A
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1'
B
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42
7
2
9
23
37
35
13
6
34
36
31
65
33
10
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92
95
93
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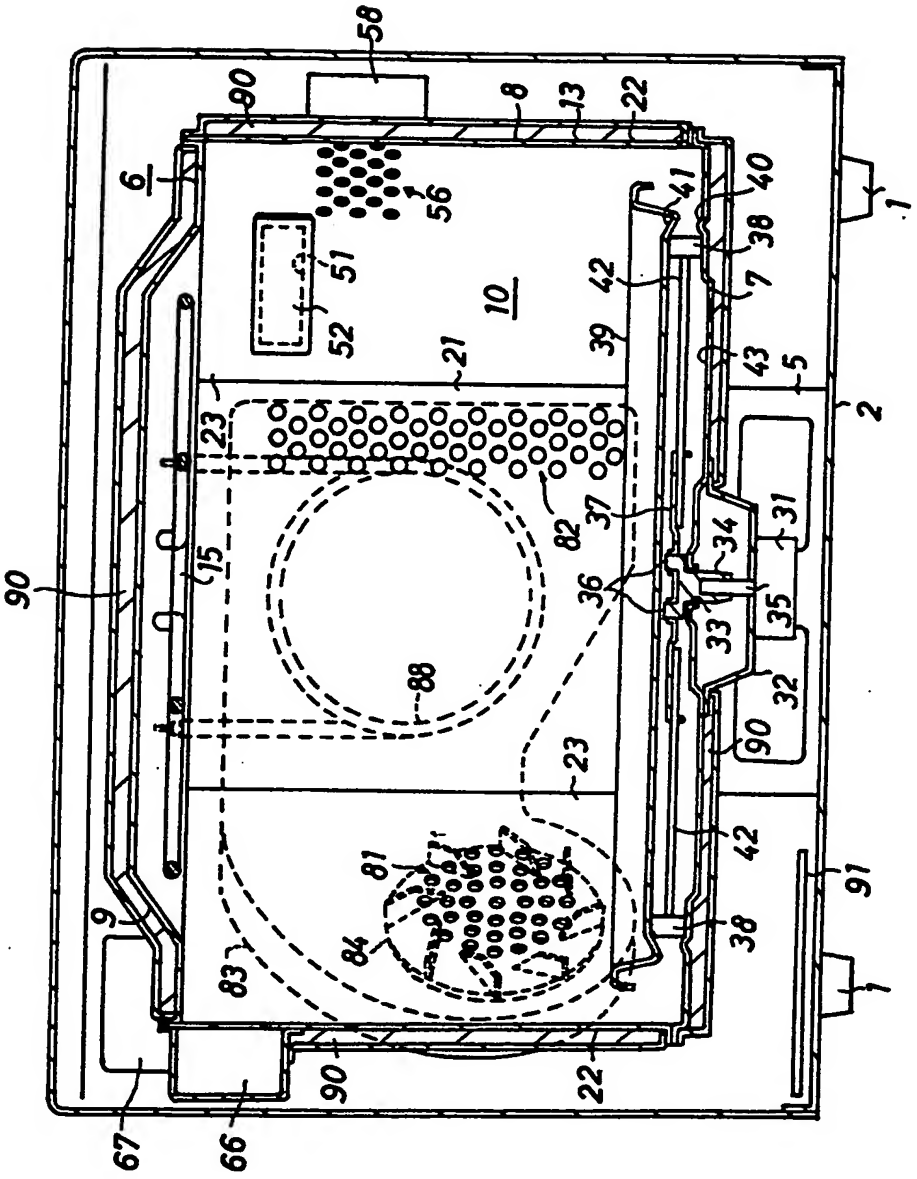
B
1
4
A
3
14
94
12
22
11

Fig. 3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34
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67
66

Fig. 4

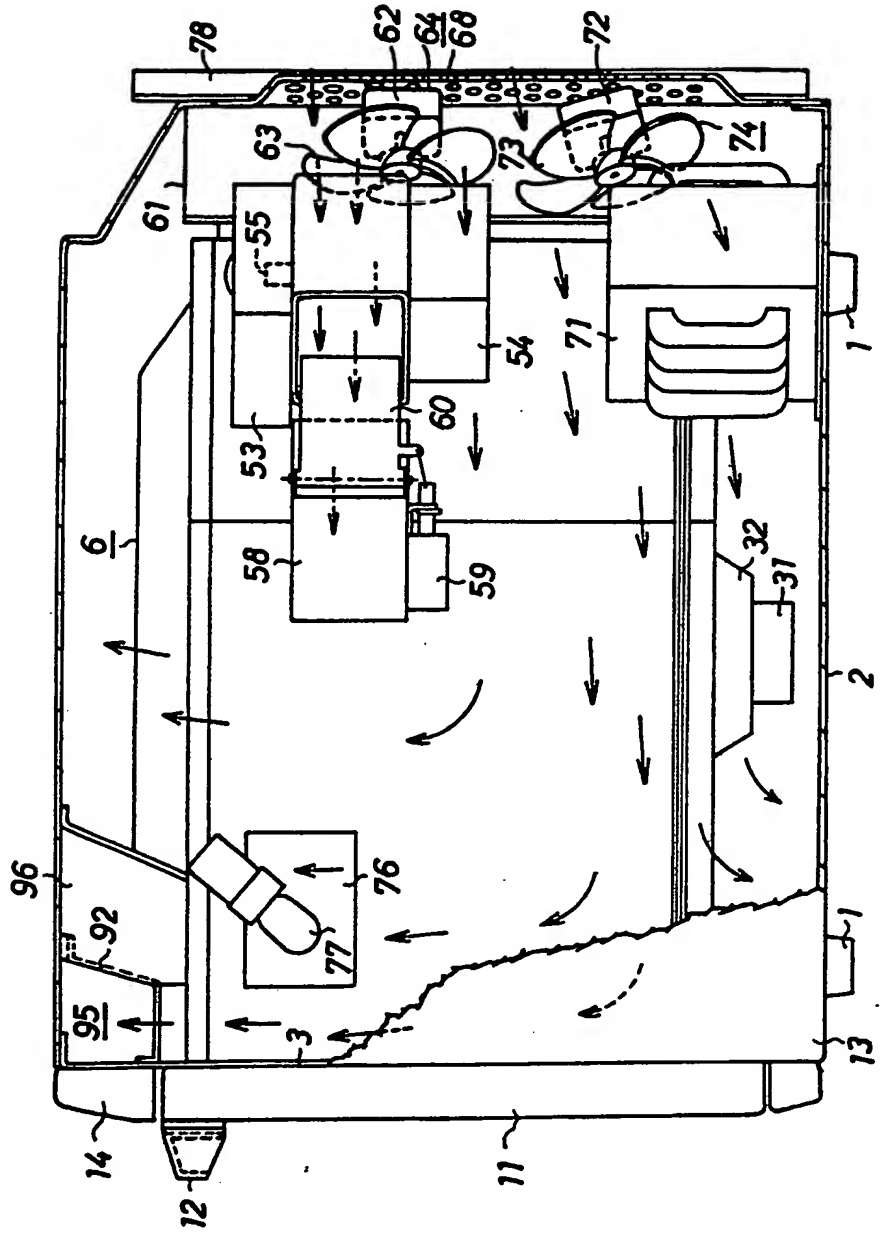
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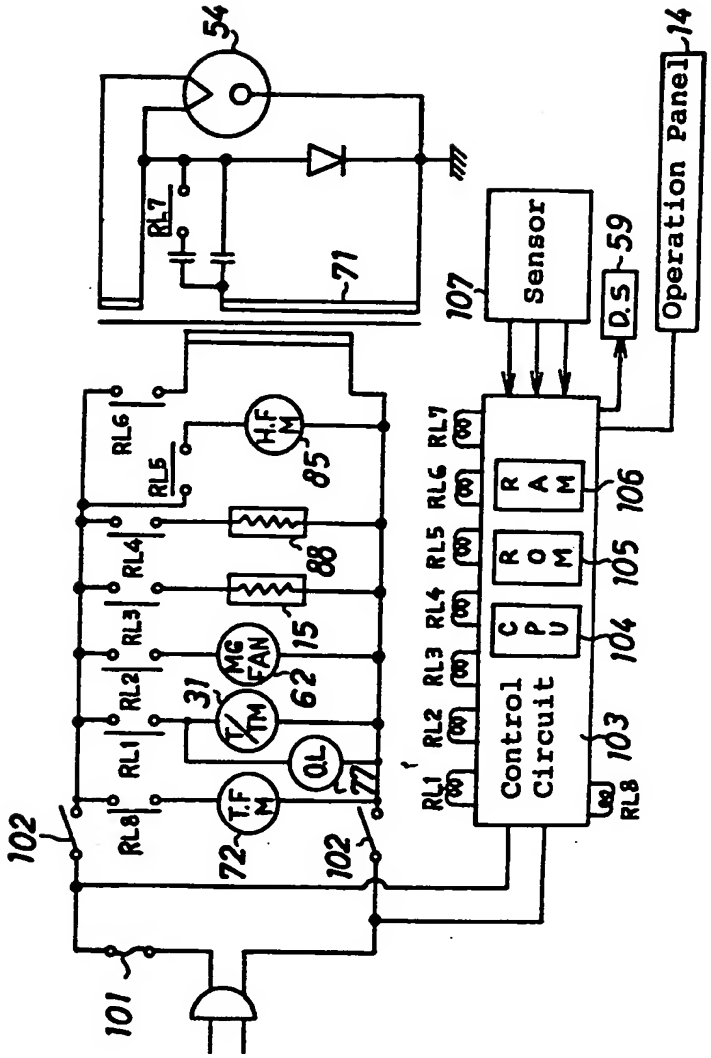
Fig. 5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RL7
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107
Sensor
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Operation Panel
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RL6
RL5
H.F M
85
RL4
88
RL3
15
RL2
31
M.G FAN
62
RL1
T.M
OL
77
RL8
T.F M
72
102
102
101
RL1 RL2 RL3 RL4 RL5 RL6 RL7
Control Circuit
C P U
R O M
R A M
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104
105
106
RL8

Fig. 6

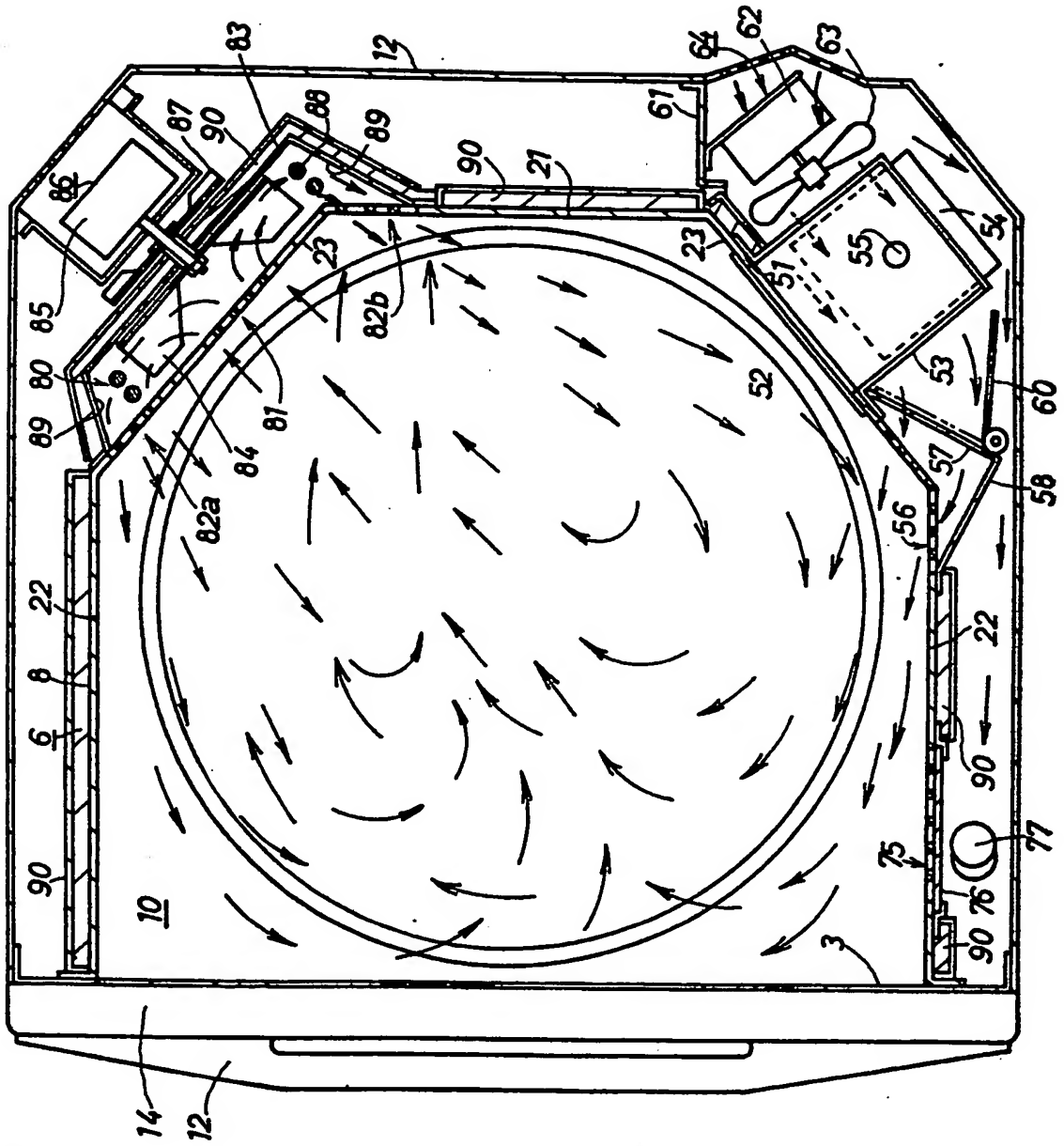
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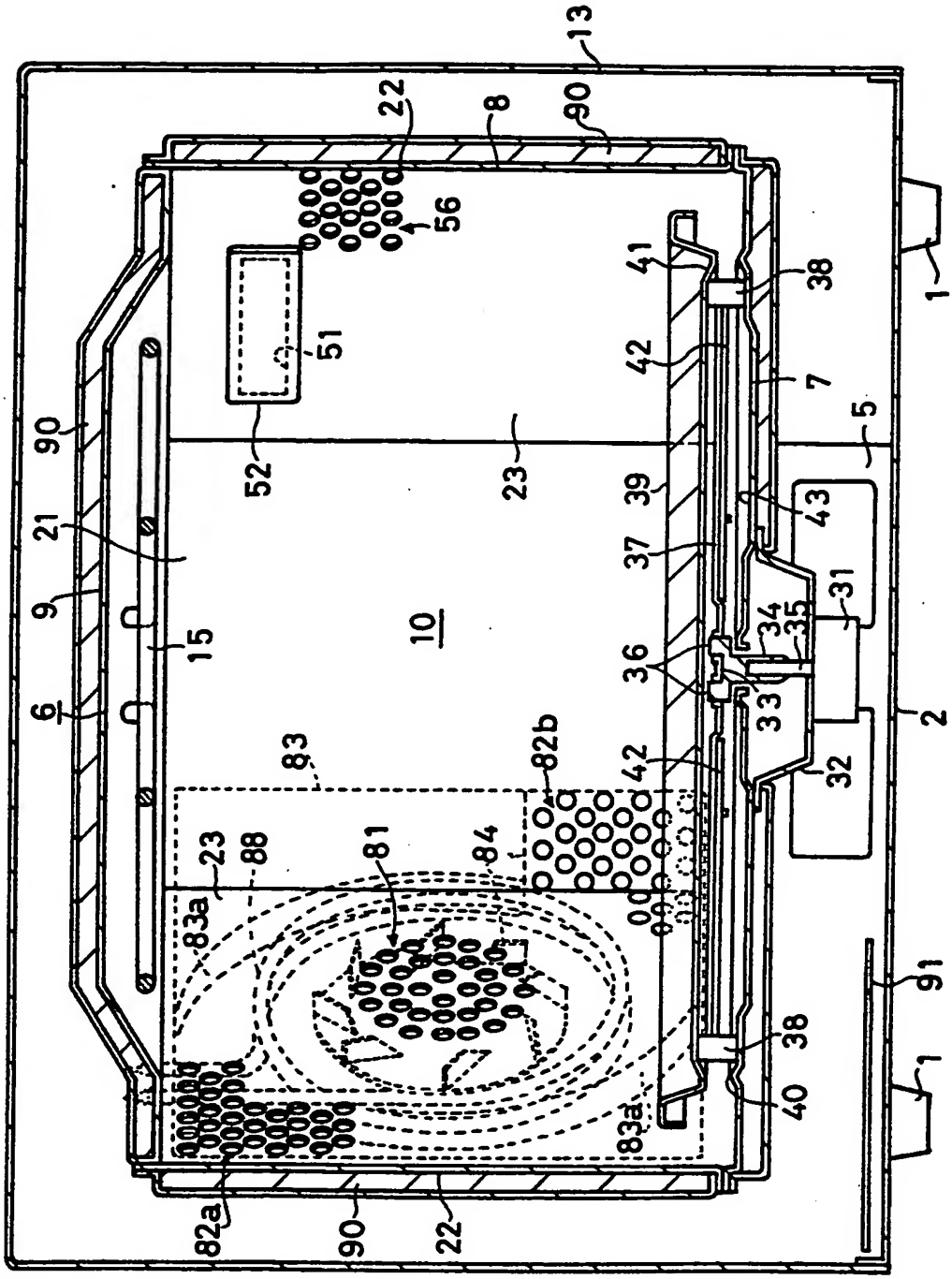
Fig. 7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83a
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82a
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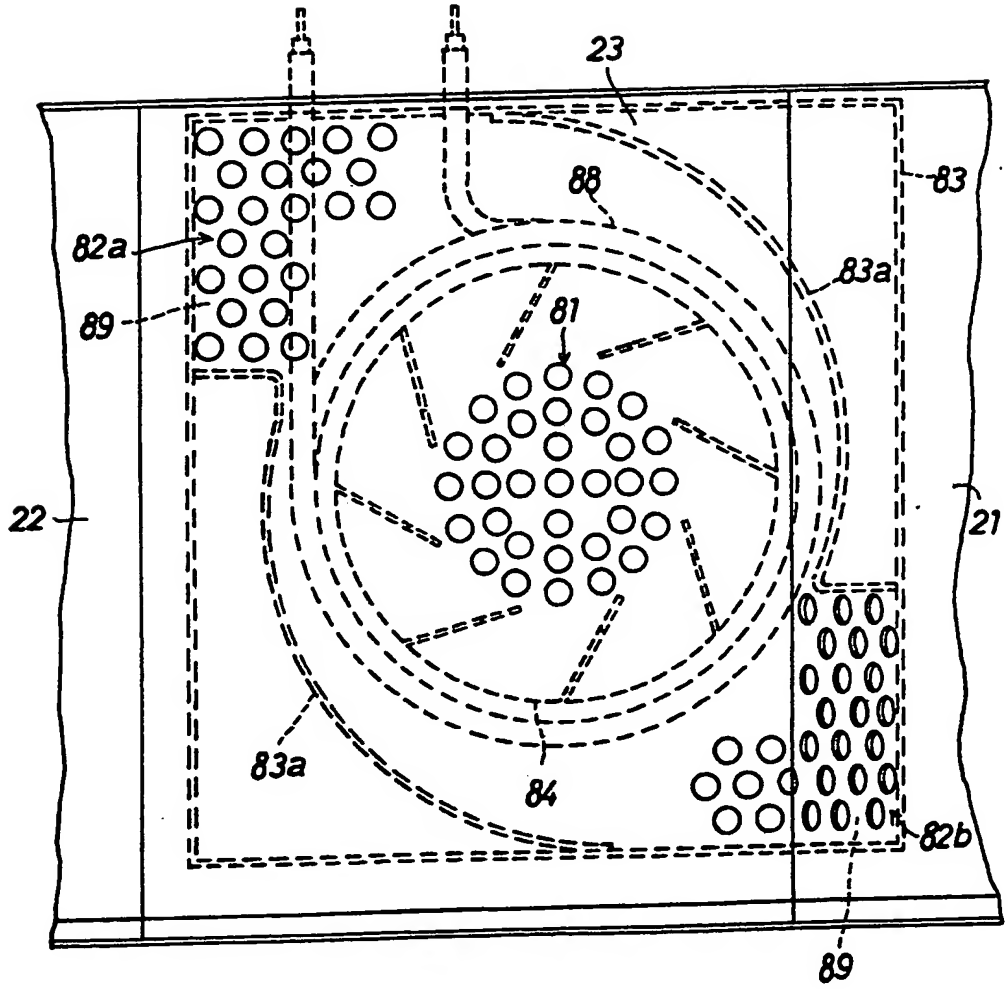
Fig. 8

Fig. 9



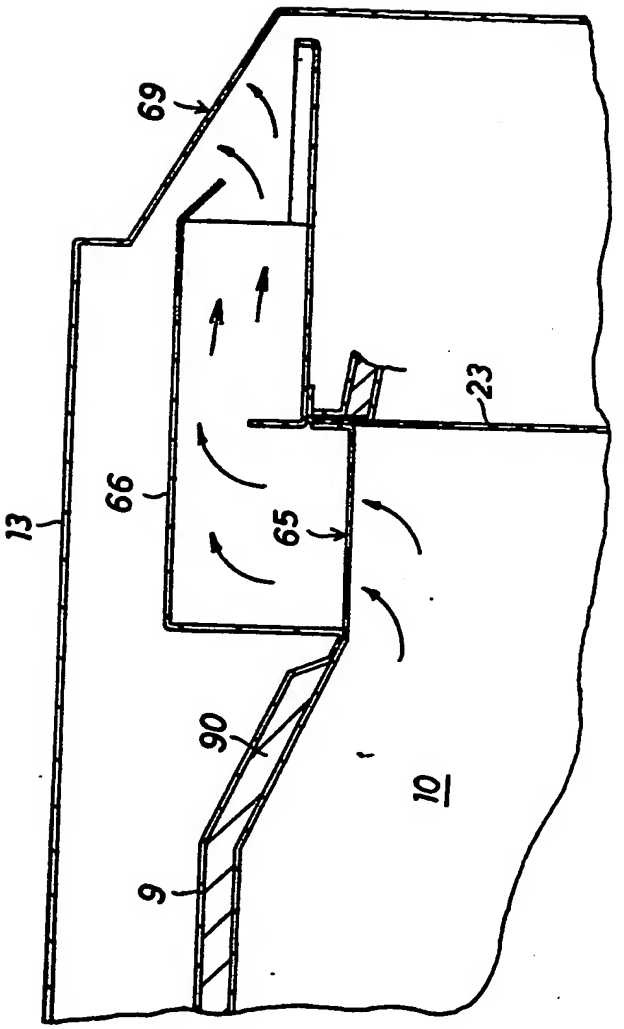
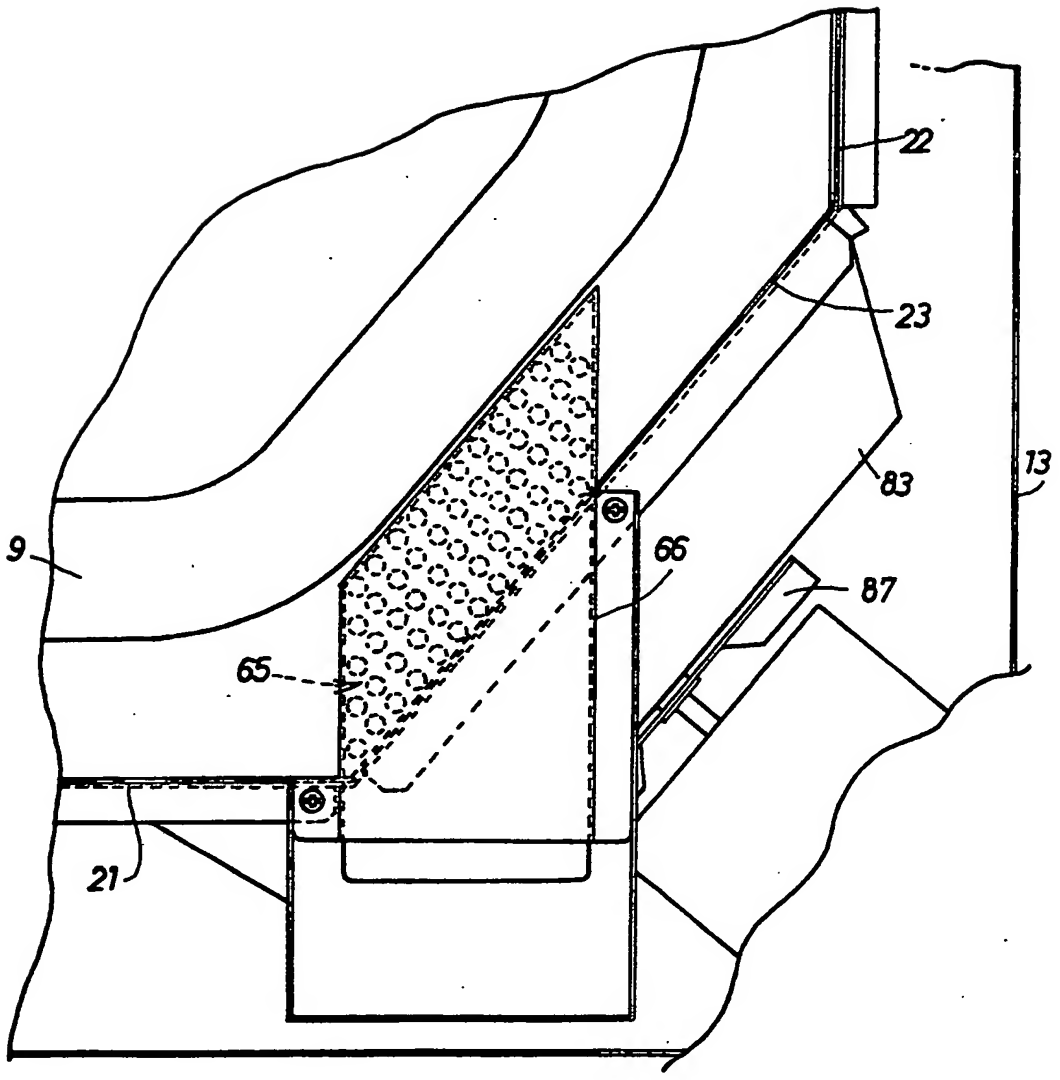


Fig. 10

Fig. 11



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ELECTRONIC OVEN

BACKGROUND OF THE INVENTION

This invention relates to an electronic oven that supplies microwaves in its cavity by means of a microwave generator in order to cook a material therein.

In many conventional electronic ovens, a cavity for containing a cooking material has square planes and a microwave generator and a hot air circulator for heating the oven are located at the rear, side or top of the cavity. Because the microwave generator and the hot air circulator such as a fan motor are relatively large, they project outwardly from the cavity, thus increasing an overall size of the oven. These days, the cavity and a turntable at the bottom of the cavity are desired to be large enough for cooking large materials such as a block of meat. As a result, the oven must be become larger and larger.

SUMMARY OF THE INVENTION

An object of this invention is to provide an electronic oven having a large turntable in a large cavity and efficient cooking ability in addition to having a small overall size.

Further objects and advantages of this invention will be apparent from the accompanying drawings.

BRIEF EXPLANATION OF DRAWINGS

Figs. 1 through 6 show an electronic oven as a first embodiment of the invention.

Fig. 1 is a plane cross section of the cavity of the oven.

Fig. 2 is another plane cross section showing the

details of the inner cabinet of the oven.

Fig. 3 is a sectional side elevation taken along the center in the longitudinal direction of the oven.

Fig. 4 is a section view taken along the center in the cross direction of the oven.

Fig. 5 is a sectional side elevation of the oven, partly showing a magnetron and a transformer.

Fig. 6 is a circuit diagram showing an electric structure of the oven.

Figs. 7 through 11 show an electronic oven as a second embodiment of the invention.

Fig. 7 is a plane cross section of the cavity of the oven.

Fig. 8 is a sectional side elevation taken along the center in the longitudinal direction of the oven.

Fig. 9 is a fragmentary front view enlarging suction holes and draft holes.

Figs. 10 and 11 are a fragmentary sectional view and a fragmentary plan view, respectively, showing exhaust holes and a duct.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Hereinafter, a first embodiment of the present invention will be detailed according to the drawings.

As shown in Fig. 3, a front plate 3 stands from the front edge of an outer bottom plate 2 having four feet 1. The front plate 3 has an opening 4 for putting in and taking out any materials to be cooked. Above the outer bottom plate 2 is mounted an inner cabinet 6 via the front plate 3 and a

support plate 5. The inner cabinet 6 consists of a bottom wall 7 fixed by the front plate 3 and the support plate 5, a surrounding wall 8 standing along the edges of the bottom wall 7, and a top wall 9 fixed on the upper edge of the surrounding wall 8. The bottom wall 7, the surrounding wall 8, and the top wall 9 form a cavity 10.

A door 11 with a handle 12 pivots at its lower end for opening and closing the opening 4. An outer cabinet 13 is attached to the edges of the front plate 3 and the outer bottom plate 2, thus making an exterior of the oven. An operation panel 14 with various switches (not shown) is provided on the front plate 3 at a small interval from the upper end of the door 11.

As shown in Fig. 1, the surrounding wall 8 consists of a rear wall 21, a pair of side walls 22, and a pair of bias walls 23. The rear wall 21 stands parallel to the closed door 11. The side walls 22 are opposite to each other and each of them falls at a substantially right angle with the closed door 11. The bias walls 23 respectively extend from the right and left ends of the rear wall 21 to the rear ends of the side walls, and they make a particular angle, e.g., 40 degrees in this embodiment, with the rear and side walls 21 and 22. Thus, the cavity 10 determined by the surrounding wall 8 and the front plate 3 has a hexagonal cross section.

As shown in Fig. 3, a border 7a of the bottom wall 7, more particularly, three sides of the bottom wall 7 except the front side, bends upward and then outward. A bottom edge 8a of the surrounding wall 8 bends outward. The border 7a

and the bottom edge 8a are adhered by spot welding and fixed on the support plate 5. Therefore, oil or any other liquid which has dropped on the bottom wall 7 does not leak out of the cavity from between the border 7a and the bottom edge 8a.

As shown in Figs. 3 and 4, a motor 31 is attached on the substantial center of the lower surface of the bottom wall 7 by means of a bracket 32. There is provided a support hole 33 substantially in the middle of the bottom wall 7 for allowing a coupling 34 to rotate therein. The coupling 34 in the support hole 33 is connected with a motor shaft 35 of the motor 31. Several connecting projections 36 of the coupling 34 are connected with a rotor 37 having four arms 42. A roller 38 is rotatably attached to the end of each arm 42. The rotation of the motor 31 is transmitted to the coupling 34 and the rotor 37, and then the rollers 38 roll over the bottom wall 7. A metal turntable 39 is mounted on the rollers 38 so that the turntable 39 is rotated by the rolling of the rollers 38. The bottom wall 7 has a projecting ring 40 out of the range of the rollers 38 and also has a lowered ring 43 within the range of the rollers 38. Therefore, oil or any other liquid cannot reach the coupling 34 or the motor 31.

As shown in Figs. 1 and 3, the sizes of the round turntable 39 and the cavity 10 are determined in the following manner. On condition that the turntable 39 is set on the rollers 38, it is the same distance between the periphery of the turntable 39 and each of the inner face of the door 11, the rear wall 21, and the bias walls 23, as

denoted by "A" in the drawings. Further, the distance between the side wall 22 and the periphery of the turntable 39 is greater than the above distance "A". In this embodiment, the distance "A" is about 5mm, that is, a minimum distance which does not cause sparking between the inner surface of the walls and the turntable 39.

As shown in Fig. 3. the turntable 39 has a slant rim 41 that lowers outwardly and makes an angle θ of 30° to 40° with the horizontal plane. When the turntable 39 is centered at the coupling 34, a distance between the lowest point of the slant rim 41 and the outer end of the roller 38, as denoted by "B" in the drawing, has a following relation with the above-mentioned distance "A":

$$A \leqq 0.8B$$

Because of this relation, even when the turntable 39 is set on the rotor 37 considerably off the center, the slant rim 41 of the turntable 39 does not come off from the rollers 38 of the rotor 37, In such case, the turntable 39 will be centered correctly by the slant face of the slant rim 41 when the closed door 11 touches the turntable 39 or the rotor 37 rotates. Furthermore, because the distance is sufficient between the periphery of the turntable 39 and the side walls 22, it is very easy to put in and take out the turntable 39.

As shown in Fig. 3, a grill heater 15 is provided near the top wall 9.

As shown in Fig. 4, on the upper portion of the right bias wall 23 is provided a window 51 that is covered by a covering plate 52 made of a microwave-transmissible material.

As shown in Fig. 1 on the outer surface of the same bias wall 23, a magnetron 54 with an antenna 55 is held in a waveguide 53. This magnetron 54 as a microwave generator sends microwaves into the cavity 10 through the opposite window 51.

As shown in Figs. 1 and 4, a plurality of air inlet holes 56 are formed on the bias wall 23 and the adjacent side wall 22 in front of the magnetron 54. Opposite to the air inlet holes 56, a duct 58 having an opening 57 extends over the bias wall 23 and the side wall 22. A lid 60 is attached to the duct 58 to open and close the opening 57 by means of a solenoid 59 shown in Fig. 5. A bracket 61 stands on the bottom wall 7, in the rear of the magnetron 54, close to the bias wall 23. On this bracket 61 is mounted an air blower 64 comprising a motor 62 and a fan 63. The second side wall 22, opposite to the above-mentioned first side wall 22 having the air inlet holes 56, has a number of exhaust holes 65 on its upper portion near the bias wall 23. To these exhaust holes 65 is connected one end of a duct 66 that is fixed on the outer surface of the side wall 22. The other end of the duct 66 opens upward near the bias wall 23, and a guide plate 67 is attached to this opening end.

While the magnetron 54 is operating independently, i.e., during high-frequency heating, the fan 63 rotates and the lid 60 opens toward the outer cabinet 13 to pass air between the duct 58 and the magnetron 54, as shown in Fig. 1. As a result, fresh air is drawn into the electronic oven through air lead-in holes 68 on the outer cabinet 13 in order to cool the magnetron 54. Then, the air is led into the cavity 10

through the duct 58 and the air inlet holes 56 for ventilation of the cavity 10. The air, which includes steams in the cavity 10, is led into the duct 66 through the exhaust holes 65, and then discharged out of the oven through the open end of the duct 66 and air release holes 69 on the outer cabinet 13. The fresh air coming from the air inlet holes 56 on the bias wall 23 travels almost straight toward the door 11, and then passes along the door 11 toward the exhaust holes 65. Since the fresh air always travels along the door 11 in such a way, it can prevent the inner surface of the door 11 from being misted by the steam.

As shown in Fig. 3, the guide plate 67 at the rear end of the duct 66 guides the discharged air toward the air release holes 69 and prevents the air from flowing into the electronic oven. As shown in Fig. 2, the air which has not flowed into the duct 58 passes between the outer cabinet 13 and the inner cabinet 6 to cool the upper portion of the inner cabinet 6 before leaving the oven through the air release holes 69.

As shown in Fig. 5, a transformer 71 is mounted on the bottom wall 7 below the magnetron 54. At the rear of the transformer 71 and below the blower 64, another blower 74 comprising a motor 72 and a fan 73 is attached to the bracket 61.

When the magnetron 54 operates, that is, when the transformer 71 works, the fan 73 cools the transformer 71 by sending fresh air from the air lead-in holes 68. Then, the air passes over the upper surface of the inner cabinet 6 and

between the cabinet 6 and the outer bottom plate 2 until it is discharged from the air release holes 69 and other air release holes 69, as shown in Figs. 1 and 3. In order to guide upward the air released from the air release holes 70, a passage member 78 is provided on the rear surface of the outer cabinet 13.

During the electronic oven's operation including the independent working of the magnetron 54, the fans 64 and 74 are always rotating to cool the circumference of the inner cabinet 6. In order to prevent the fresh air from entering the cavity 10 and lowering the temperature therein, the lid 60 of the duct 58 is closed except when the magnetron 54 is independently working.

As shown in Figs. 1 and 5, the side wall 22 near the magnetron 54 has a group of small lighting holes 75 on its upper front portion. A glass plate 76 covers these lighting holes 75, and behind the glass plate 76 is a cavity lamp 77.

As shown in Figs. 1, 3 and 4, the bias wall 23 on the side opposite to the magnetron 54 has suction holes 81 that are arranged in a circle on the lower portion of the wall 23. The rear wall 21 has draft holes 82 that are lined up vertically near the magnetron 54. In order to form a circulation passage 80 between these holes 81 and 82, a passage wall 83 extends along the rear surface of the rear wall 21 and the bias wall 23. To the passage wall 83 is attached a blower 86 which comprises a fan 84 and a motor 85 inside and outside the passage 80, respectively, and faces the suction holes 81. A ring-type oven heater 88 is located

in the circulation passage 80 so as to face the draft holes 82. Further, there is another fan 87 for cooling the motor 85. In order to face the blower 86, air holes 97 are provided on the outer cabinet 13.

When the blower 86 and the oven heater 88 are working, the air in the cavity 10 is drawn through the suction holes 81 into the circulation passage 80. After the air is heated by the oven heater 88, it is sent back to the cavity 10 through the draft holes 82 so as to circulate therein and heat a cooking material on the turntable 39. Because the suction holes 81 are on the bias wall 23 that forms an angle of 35 to 55 degrees (40 degrees in the present embodiment) to the side wall 22, the suction holes 81 almost face the center of the turntable 39 and draws the air therefrom. Furthermore, the passage wall 83 comprises a guide member 89 near the heater 88 in order to guide the heated air toward the side wall 22 near the magnetron 54. Therefore, the hot air is moved toward the circumference of the turntable 39. As shown by arrows in Fig. 1. the hot air released in the cavity 10 travels around therein before it is drawn from the suction holes 81. As a result, a cooking material on the turntable 39 can be heated uniformly and efficiently.

The holes 56, 65, 75, 81 and 82 on the rear wall 21, the side wall 22 and the bias walls 23 are small enough to block the microwaves. Except their parts-mounting portions and hole portions, the bottom wall 7, the surrounding wall 8, the top wall 9, and the passage wall 83 have double structure of heat insulating plates between which a heat insulating

material 90 is placed.

As shown in Figs. 3 and 4, a circuit substrate 91, including relays which are described later, is located on the outer bottom plate 2 below the inner cabinet 6. This circuit substrate 91 is cooled mainly by the air from the blower 74. The outer bottom plate 2 has small holes (not shown) below the circuit substrate 91 for introducing the cooling air.

As shown in Figs. 2, 3 and 5, a heat insulating plate 92 is placed, opposite to the operation panel 14, between the front plate 3 and the outer cabinet 13. At an end of the heat insulating plate 92 is provided a guide plate 96 for leading air from the blowers 64 and 74 to a passage 95 between the guide plate 96 and the operation panel 14. The front plate 3 has an air hole 93 adjacent to the operation panel 14, and the operation panel 14 has an exhaust hole 94 on its lower portion.

The heat insulating plate 92 prevents the hot air around the top wall 9 of the inner cabinet 6 from getting to the operation panel 14. The air from the blowers 64 and 74 is led into the passage 95 and then released via the air hole 93, the exhaust hole 94, and a clearance between the operation panel 14 and the door 11. Accordingly, the heat around the heat insulating panel 92 and the passage 95 is eliminated. Therefore, it is possible to prevent some troubles or malfunctions of the electronic oven owing to the heated operation panel 14. As shown by arrows in Fig. 2, the air led into the passage 95 is also released from the above-mentioned air-release holes 69.

Hereinafter, an electric structure of the electronic oven of the present embodiment will be described according to Fig. 6.

In an AC power circuit, the cavity lamp 77, the motor 31 for the turntable, the fan motors 62 and 72 for the magnetron and the transformer. The fan motor 85 for circulating the heated air, the grill heater 15, and the oven heater 88 are connected in parallel via a fuse 101 and a door switch 102. The magnetron 54 is connected via the transformer 71. Also a control circuit 103 including a microcomputer is connected to the power circuit. The control circuit 103 has a CPU 104 for controlling the operation of the oven, a ROM 105 for storing programs and tables of cooking time according to source voltage, and a RAM 106 for temporarily storing detected data. This control circuit 103 turns on and off the solenoid 59 for the lid 60 as well as relays RL1-RL8 for actuating the motors, the heating means, and so forth. A sensor 107 includes several sensors which detect source voltage, temperature in the cavity 10 or in the circulation passage 80, and so forth, and detection signals from these sensors are put in the control circuit 103.

When one of several cooking methods including microwave cooking, oven cooking, grill cooking, and combination cooking is selected by a selector switch on the operation panel 14, the relays RL1-RL8 and the solenoid 59 are properly turned on or off in order to perform the selected method. More specifically, in order to perform the microwave cooking, the relays RL6 and RL7 are turned on at the same time to

oscillate the magnetron 54 with high power. In order to perform the oven cooking, the relays RL4 and RL5 are turned on to actuate the oven heater 88 and the fan motor 85 for circulating the heated air. In order to perform the grill cooking, the relay RL3 is turned on to actuate the grill heater 15. In order to perform the microwave and oven cooking, the relay RL7 is turned off and the relay RL6 is turned on to oscillate the magnetron 54 with lower power and the relays RL4 and RL5 are turned on to actuate the oven heater 88 and the fan motor 85 for the heated air circulation. In order to perform alternately the microwave and grill cooking and the oven and grill cooking, the relay RL7 maintains on-state, and the relay RL3 is sequentially turned on, and furthermore the relay RL4 and the relay RL6 are alternately turned on. As a result, the high-power oscillation of the magnetron 54 and the actuation of the oven heater 88 take place by turns while the grill heater 15 is being energized. During this alternate operation, the relay RL5 for the fan motor 85 is sequentially turned on.

In every cooking method described above, the relay RL1 is turned on to switch on the cavity lamp 77 and to rotate the turntable 39. At the same time, the relays RL2 and RL8 are turned on to rotate the fan motors 62 and 72 for the magnetron 54 and the transformer 71, respectively. During microwave cooking, the solenoid 59 is energized so as to open the lid 60 for ventilation in the cavity 10. During other cooking methods, on the other hand, the lid 61 is closed in order to exclude the outside air and prevent a fall of the

temperature in the cavity 10.

As described above, the electronic oven of the present embodiment has the bias wall 23 between the side walls 22 and the rear wall 21, and behind the bias walls 23 are located the magnetron 54, the transformer 71, the cooling blowers 64 and 74, and the blower 86 for circulating the heated air. Therefore, the whole shape of the electronic oven can be rather small without decreasing the substantial space of the cavity 10, because the corners that are partitioned by the bias walls 23 are originally dead space concerning the hot air circulation. As for the air circulation in particular, the suction holes 81 and the draft holes 82 are arranged on the bias wall 23 and the rear wall 21, respectively. Thus, the suction holes 81 face the substantial center of the turntable 39, and the opening direction of the suction holes 81 is different from that of the draft holes 82. Moreover, the guide member 89 is provided in the circulation passage 80 in order to lead the heated air from the draft holes 82 toward the side wall 22 next to the bias wall 23 without any holes. Therefore, the heated air travels almost all around the cavity 10 along the bias wall 23 and the side wall 22 to ensure uniform heating.

Hereinafter, a second embodiment of the present invention will be described as to its structure that differs from that of the first embodiment according to Figs. 7 through 11.

As shown in Figs. 10 and 11, exhaust holes 65 are arranged on the top wall 9 over the rear end of the bias wall

23 that is hot adjacent to the magnetron 54. The air release holes 69 on the outer cabinet 13 are located close to the exhaust holes 65, and a short duct 66 connected to the exhaust holes 65 extends up to the air release holes 69.

As shown in Fig. 7, generally in the middle of the circulation passage 80, suction holes 81 arranged in a circle are provided near the center of the above-mentioned bias wall 23 but slightly close to the rear wall 21. Draft holes 82b and 82a are provided on the end of the rear wall 21 adjacent to the bias wall 23 and on the end of the bias wall 23 adjacent to the side wall 22, respectively. Because the draft holes 82a are located on the upper portion of the bias wall 23 and the other draft holes 82b are located on the lower portion of the rear wall 21, the draft holes 82a and 82b are symmetrical with respect to the suction holes 81, as shown in Fig. 9.

A passage wall 83 in this second embodiment is smaller than that in the first embodiment and large enough to stride over those draft holes 82a and 82b. Similarly to the first embodiment, the blower 86 for the hot air circulation is mounted on the passage wall 83 so as to face the bias wall 23. As shown in Figs. 7 and 8, a ring-shaped oven heater 88 extends near the draft holes 82a and 82b, and it surrounds the fan 84 of the blower 86.

When the oven heater 88 and the blower 86 operate, the air drawn from the suction holes 81 passes the heater 88 and enters the cavity 10 through the draft holes 82a and 82b on both sides of the suction holes 81. The suction holes 81 on

the bias wall 23 generally face the center of the turntable to draw the air therefrom. As shown in Figs. 8 and 9, the passage wall 83 includes a pair of fan guides 83a extending around the oven heater 88 and forming a pair of air outlets. As shown in Fig. 7, the passage wall 83 also includes a pair of guide members 89 adjacent to those air outlets so as to lead the heated air right and left, that is , toward the rear wall 21 and the side wall 22 near the heater 88, respectively. As shown by arrows in Fig. 7, the heated air enters the cavity 10 from both sides of the suction holes 81 and gets out from the suction holes 81. Thus, the cavity 10 is heated generally all around so that cooking materials on the turntable 39 can be cooked uniformly.

Especially in the second embodiment, the exhaust duct 66 and the passage wall 83 are so small as to lower the cost.

Obviously, numerous modifications and variations of the present invention are possible in light of the above teachings within the scope of the appended claims.

CLAIMS

1. An electronic oven, comprising:

a door;

a cooking cavity for containing materials to be cooked defined by

an inner rear wall

first and second inner side walls and

first and second bias walls connected to the first and second inner side walls, respectively, and to the inner rear wall, the first and second bias walls extending at an angle to the inner side walls;

first and second outer side walls substantially parallel to the first and second inner side walls

an outer rear wall substantially parallel to the inner rear wall and connected to the first and second outer side walls;

a circulation passage formed between the first bias wall and the inner rear wall;

suction holes provided in the first bias wall through which microwaves cannot pass;

draft holes provided in the inner rear wall through which microwaves cannot pass;

heating means located in the circulation passage for heating air in the circulation passage;

circulating means for circulating the air in the circulation passage such that air is taken into the circulation passage through the suction holes and expelled from the circulation passage from the draft holes; and

microwave generating means for supplying microwaves into the cooking cavity.

2. An electronic oven, comprising:

a door;

a cooking cavity for containing materials to be cooked defined by

an inner rear wall substantially parallel to the door,

first and second inner side walls substantially orthogonal to the door and the rear wall and abutting the door, and

first and second bias walls connected to the first and second inner side walls, respectively, and to the inner rear wall, where the first and second bias walls extend at a specified angle to the inner side walls;

first and second outer side walls substantially parallel to the first and second inner side walls and abutting the door;

an outer rear wall substantially parallel to the inner rear wall and connected to the first and second outer side walls;

a circulation passage formed at a back of the first bias wall and the inner rear wall;

suction holes provided in the first bias wall through which microwaves cannot pass;

draft holes provided in the inner rear wall through which microwaves cannot pass;

heating means located in the circulation passage for heating air in the circulation passage;

circulating means for circulating the air in the circulation passage such that air is taken into the circulation passage through the suction holes and expelled from the circulation passage from the draft holes; and

microwave generating means for supplying microwaves into the cooking cavity.

3. The electronic oven of claim 1 or 2 in which:

a first cavity is formed by the first bias wall, the first outer side wall, and the outer rear wall;

a second cavity is formed by the second bias wall, the second outer side wall, and the outer rear wall;

the circulating means is located in the first cavity; and

the microwave generating means is located in the second cavity.

4. The electronic oven of claim 1, 2 or 3 further comprising rotating means mounted in the cooking cavity for rotating the material to be cooked about an axis parallel to the inner side and inner rear walls.

5. The electronic oven of any preceding claim further comprising:

guide means for guiding the heated air and located in the circulating passage; wherein

the draft holes are provided in an area of the inner rear wall adjacent to the second bias wall; and

the guide means guide the heated air from the circulating passage through the draft holes into the cooking cavity.

6. The electronic oven of claim-5, in which the circulating means comprises a fan the axis of rotation of which faces the suction holes, where blades of the fan are designed such that air is drawn from the cooking cavity into the circulating passage and blown radially from the axis of rotation of the fan along the blades of the fan; and

the heating means comprise a heating element formed between the fan and the guide means.

7. The electronic oven of claim 6, in which the guide means comprises a guide wall formed at an end of the heating element distal to the fan, where the guide wall is adjacent to a point where the inner rear wall is connected to the second bias wall.

8. The electronic oven of any one of claims 1 to 4 further comprising:

supplemental draft holes provided in the first bias wall; wherein

the draft holes are provided in an area of the inner rear wall adjacent to the first bias wall; and

the supplemental draft holes and draft holes are substantially symmetrically spaced on either side of the suction holes.

9. The electronic oven of claim 8, further comprising first and second guide means located in the circulating passage for guiding the heated air out of the draft holes and supplemental draft holes respectively.

10. The electronic oven of claim 9, in which:

the circulating means comprises a fan the axis of rotation of which faces the suction holes, where blades of the fan are designed such that air is drawn from the cooking cavity into the circulating passage and blown radially from the axis of rotation of the fan along the blades of the fan;

the first and second guide means comprise first and second guide walls located on either side of the fan; and

the heating means comprise first and second heating elements formed between the fan and the first and second guide walls, respectively.

11. The electronic oven of claim 10, in which:

a first cavity is formed by the first bias wall, the first outer side wall, and the outer rear wall;

a second cavity is formed by the second bias wall, the second outer side wall, and the outer rear wall;

the heating means and the circulating means are located in the first cavity; and

the microwave generating means is located in the second cavity.

12. An electronic oven constructed and arranged substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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